

CLAIMS:

1. A method of reducing the ethanol content of a beverage which includes ethanol and volatile components:

5 separating the beverage into first and second streams, the first stream including ethanol and the volatile components and the second stream including ethanol but none or little of the volatile components;

contacting the second stream with a strip solution to produce a treated second stream to reduce the ethanol concentration thereof; and

10 mixing the treated second stream with the first stream whereby the ethanol content of the beverage is reduced but the volatile components remain substantially unchanged.

2. A method as claimed in claim 1 wherein the step of contacting the second stream with the strip solution is carried out at a temperature which is higher than the temperature 15 of the beverage.

3. A method as claimed in claim 2 wherein the temperature of the strip solution is in the range 45° to 55°C.

20 4. A method as claimed in claim 2 or 3 wherein the strip solution is heated to said temperature prior to contacting said second stream.

5. A method as claimed in any one of claims 1 to 4 wherein the beverage is wine.

25 6. A method of reducing the alcohol content of an alcohol containing beverage including the steps of:

(i) processing the beverage by reverse osmosis or nanofiltration for producing a retentate and a raw permeate which includes alcohol;

30 (ii) contacting a first side of an hydrophobic microporous membrane with said raw permeate;

(iii) contacting a second side of the membrane with a strip solution to extract

alcohol therefrom to form a dealcoholised permeate; and

(iv) combining the retentate with the dealcoholised permeate to form a dealcoholised beverage which has an alcohol content lower than that of the beverage.

5 7. A method as claimed in claim 6 wherein the strip solution is heated to a temperature which is higher than that of the beverage prior to contacting the strip solution with the membrane.

8. A method as claimed in claim 7 wherein the temperature of the strip solution is in
10 the range 45° to 55°C prior to contacting the membrane.

9. A method as claimed in any one of claims 6 to 8 wherein said new permeate is heated prior to contacting the membrane.

15 10. A method as claimed in any one of claims 6 to 9 wherein the beverage includes volatile components and wherein the membrane is selected so that substantially all the volatile components remain in said retentate.

11. A method as claimed in any one of claims 6 to 10 wherein the beverage is wine.

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12. A method as claimed in any one of claims 6 to 11 wherein the strip solution is water.

25 13. A method as claimed in claim 12 wherein carbon dioxide and/or oxygen is removed from the water prior to contracting the membrane.

14. A method as claimed in claim 12 or 13 wherein carbon dioxide and/or oxygen is removed from the raw permeate to contacting the membrane.

30 15. A method as claimed in any one of claims 6 to 14 wherein the raw permeate has an alcohol in a predetermined percentage range and after contacting the membrane the

dealcoholised permeate has an alcohol content in a range which is substantially lower than that of the raw permeate.

16. A method as claimed in claim 15 wherein the alcohol content of the dealcoholised
5 permeate is in the range 3% to 6% of volume.

17. A method as claimed in claim 15 or 16 wherein the alcohol content of the dealcoholised beverage is 0.5% to 1.5% lower than that of the beverage.

10 18. A method as claimed in claim 17 including the step of determining if the alcohol content of the dealcoholised beverage is at or below a predetermined level and storing the dealcoholised beverage if it is at or below said predetermined level.

19. A method as claimed in claim 18 wherein the beverage is stored in a container and
15 the method includes the steps of determining if the alcohol content of the dealcoholised beverage is at or below a predetermined level and returning the dealcoholised beverage to the container if the alcohol content of the dealcoholised beverage is above said predetermined level.

20 20. Apparatus for reducing the alcohol content of an alcohol containing beverage, the apparatus including:

(i) a first processing stage having a reverse osmosis unit or nanofiltration unit having a retentate outlet and permeate outlet;

25 (ii) a pump for supplying beverage to be treated under pressure to the first processing stage whereby retentate is produced at the retentate outlet and raw permeate containing alcohol is produced at the permeate outlet;

(iii) a second processing stage which includes at least one hydrophobic microporous membrane, the second processing stage having an inlet for receiving said raw permeate, the membrane being operable to remove at least a portion of the alcohol from
30 the raw permeate so as to produce dealcoholised permeate at an outlet of the second processing stage; and

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(iv) means for combining said dealcoholised permeate with said retentate to thereby produce dealcoholised beverage in which the alcoholic content thereof is lower than that of the beverage.

5 21. Apparatus as claimed in claim 20 wherein the second processing stage includes at least one contactor within which said membrane is located and wherein the contactor includes strip solution inlets and outlets whereby the strip solution contacts the membrane on the opposite to that contacted by the raw permeate.

10 22. Apparatus as claimed in claim 21 including pumping means for pumping the strip solution through said at least one contactor.

23. Apparatus as claimed in claim 22 including heating means for heating the strip solution prior to passing through said at least one contactor.

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24. Apparatus as claimed in claim 23 including a heat exchanger for heating the raw permeate prior to passing through said at least one contactor.

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25. Apparatus as claimed in claim 24 wherein the heat exchanger is arranged to extract heat from dealcoholised beverage.

26. Apparatus as claimed in any one of claims 21 to 25 including degassing means for degassing the strip solution prior to passing through said at least one contactor.

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27. Apparatus as claimed in claim 26 wherein the degassing means removes oxygen and/or carbon dioxide from the strip solution.

28. Apparatus as claimed in any one of claims 21 to 27 including second degassing means for degassing the raw permeate prior to passing through said at least one contactor.

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29. Apparatus as claimed in claim 28 wherein the second degassing means removes oxygen and carbon dioxide from the raw permeate.

30. Dealcoholised beverage when made by the method claimed in any one of claims 1
5 to 19.

31. Dealcoholised beverage when made by the apparatus of any one of claims 20 to 29.